TITLE OF INVENTION

HIGH LIFT AND HIGH STRENGTH AEROFOIL SECTION

CROSS REFERENCE TO RELATED APPLICATIONS

Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

REFERENCE TO MICROFICHE APPENDIX

Not Applicable

BACKGROUND OF THE INVENTION

Conventional aerofoils have usually quite small thickness compared to their chord and it is difficult to provide adequate strength if they are to be efficient, especially in high speed operation. This invention relates to a high lift aerofoil section, incorporating a step, to provide a higher vertical component in its construction; the aerofoil has greater perceived root thickness giving greater lift through compression on the aerofoil undersurface, and much higher strength to the aerofoil on all axes than conventional aerofoil sections.

BRIEF SUMMARY OF THE INVENTION

According to the present invention there is provided a stepped section aerofoil profile, constructed as follows: - a conventional section aerofoil profile is chosen wherein the conventional section has a leading edge, a center portion and a trailing edge, the conventional section is at zero angle of attack, with the tip of the leading edge directly in line horizontally with the tip of the trailing edge. The conventional section has a chord length and a thickness. A box is drawn for construction purposes, the box being between one third and two thirds of the length of aerofoil chord. The height of the box is between half of and once the length of the box. The center of the box is placed over the center of the conventional section aerofoil, and the center portion of the aerofoil, between the two vertical lines of the box, is removed. The trailing edge of the conventional section is moved vertically downwards, between 0.5 and 3.0 times the thickness of the conventional section, the distance being reliant on the application of the aerofoil. The top rearmost point of the leading edge is then joined to the top foremost point of the trailing edge using an flattened 'S' shaped line, to form the top surface and the step of the stepped section aerofoil. The lower rearmost point of the leading edge is then joined to the lower foremost point of the trailing edge, using an flattened 'S' shaped line, parallel to the top surface, and to form the lower surface and step of the stepped section aerofoil. The construction box is now removed, providing the complete stepped section aerofoil profile. This stepped section aerofoil can be utilised in a number of aerofoil applications including: - aircraft wings, helicopter rotor blades, aircraft propellers, turbofan fan blades etc.

(According to the present invention there is provided conventional section aerofoil which has a step incorporated within its chord, wherein the step is defined as a substantial difference between the level of the leading edge and the level of the trailing edge of the aerofoil at zero angle of attack. The step is confined around the aerofoil chord center; the length of the step is between one third and two thirds of the aerofoil chord. The depth of the step is between one half of aerofoil thickness and three times aerofoil thickness, depending on the aerofoil application. The step is blended into the aerofoil profile as neatly as possible to create a smooth and aerodynamic airflow over the section. This aerofoil section can be utilised in a number of aerofoil applications including: - aircraft wings, helicopter rotor blades, aircraft propellers, turbofan fan blades etc.)

BRIEF DESCRIPTION OF THE SEVERAL VEIWS OF THE DRAWING

Figure 1 illustrates a typical stepped section aerofoil.

Figure 2 illustrates the section of a high aspect ratio aircraft wing incorporating a step.

Figure 2A illustrates the underside of a high aspect ratio aircraft wing incorporating a step.

Figure 2B illustrates the front view of a high aspect ratio aircraft wing incorporating a step.

Figure 3 illustrates the section of a low aspect ratio aircraft wing incorporating a step.

Figure 3A illustrates the plan view of a low aspect ratio aircraft wing incorporating a step.

Figure 3B illustrates the front view of a low aspect ratio aircraft wing incorporating a step.

Figure 4 illustrates the section of a delta aircraft wing incorporating a step.

Figure 4A illustrates the plan view of a delta aircraft wing incorporating a step.

Figure 4B illustrates the front view of a delta aircraft wing incorporating a step.

Figure 5 illustrates the section of a helicopter rotor blade incorporating a step.

Figure 5A illustrates the plan view of a helicopter rotor blade incorporating a step.

Figure 6 illustrates the section of an aircraft propeller blade incorporating a step.

Figure 6A illustrates the front view of aircraft propeller blades incorporating a step.

Figure 7 illustrates the section of a turbofan fan blade incorporating a step.

Figure 7A illustrates the front view of a turbofan fan blades incorporating a step.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings the aerofoil has a leading edge 1, a stepped section 2 and a trailing edge 3. The step 2 creates compression 4 on the undersurface of the section giving a high pressure area 5 below the aerofoil; above the aerofoil is a low pressure area 6, see Figure 1.

Referring to Figure 2 the stepped aerofoil is incorporated into a high aspect ratio aircraft wing. The step depth is between half of wing thickness and once wing thickness at the wing

root. The step tapers, from maximum depth inboard, to zero depth at the wing tip, see Figures 2A and 2B.

Referring to Figure 3 the stepped aerofoil is incorporated into a low aspect ratio aircraft wing. The step depth is between once wing thickness and twice wing thickness at the wing root. The step tapers, from maximum depth inboard, to zero depth at the wing tip, see Figures 3A and 3B.

Referring to Figure 4 the stepped aerofoil is incorporated into a delta aircraft wing. The step depth is between twice wing thickness and three times wing thickness at the wing root. The step tapers, from maximum depth inboard, to zero depth at the wing tip, see Figures 4A and 4B.

Referring to Figure 5 the stepped aerofoil is incorporated into a helicopter rotor blade. The step depth is between half of blade thickness and twice blade thickness. The step is not tapered and the depth is constant along the whole blade, see Figure 5A.

Referring to Figure 6 the stepped aerofoil is incorporated into an aircraft propeller blade. The step depth is between half of blade thickness and twice blade thickness. The step is not tapered and the depth is constant along the whole blade, see Figure 6A.

Referring to Figure 7 the stepped aerofoil is incorporated into a turbofan fan blade. The step depth is between half of blade thickness and twice blade thickness at the blade tip. The step tapers, from maximum depth outboard, to zero depth at the root, see Figure 7A.

The stepped aerofoil is able to be used for a great many applications which require aerofoils; for lift or downforce, thrust or suction or for turbine blades.